CLAIMS

1.   A method for the vectorization of line objects in a colour or grayscale image comprising the steps of:

    (a) collecting sample data of line points on line

5 objects within said image,

    (b) extracting multiple features from the collected sample data to represent characteristics of the line points,

    (c) grouping said data into a plurality of clusters in a multi-dimensional feature space, each said cluster

10 comprising a plurality of line points having feature measures within a selected criteria set,

    (d) detecting further line points by matching image points to said clusters and rejecting image points not falling within any cluster,

15   (e) performing a line tracing operation based on the detected line points and features; and

    (f) identifying and correcting possible errors.

2.   A method as claimed in claim 1 wherein said sample data is collected interactively by means of a user identifying two

20 points on a line and said sample data corresponding to line points between said identified points.

3.   A method as claimed in claim 2 wherein the line centre of each line point is located prior to said multiple features being extracted.

4.   A method as claimed in claim 3 wherein the line centre of each identified point is also located.

5.   A method as claimed in claim 3 or claim 4 wherein the line centre is located by determining the peak of the colour ridge profile of the line at the point location.

6.   A method as claimed in claim 3 or claim 4 wherein the line centre is located by determining the peak of the colour profile line width average function at the point location.

7.   A method as claimed in anyone of the preceding claims wherein said features are selected from the colour, line profile, line width, line direction and spatial location of the line points.

8.   A method as claimed in any one of the preceding claims wherein the features at each step of the method in which they are used are independently selected.

9.   A method as claimed in any preceding claim wherein the sample data is clustered in such a way that the clusters occupy a minimum area in feature space.

10.   A method as claimed in any preceding claim wherein image points are matched to clusters by means of a decision making operation that matches colour data firstly and uses other data to verify the match.

11.   A method as claimed in claim 10 wherein the other data is profile data.

12.   A method as claimed in any preceding claim wherein detected line points act as seeds for a line tracing
5 algorithm.

13.   A method as claimed in claim 7 wherein said algorithm is carried out automatically.

14.   A method as claimed in claim 13 wherein said algorithm comprises comparing each potential line point
10 within a look-ahead window with a known line point at the end of a line segment and adding the best match line point to the line segment.

15.   A method as claimed in claim 14 wherein all potential line points between the end of the line segment and
15 the best match line point are also added to the line segment.

16.   A method as claimed in claim 14 wherein if the best match line point is itself the end point of a line segment the two line segments are merged.

17.   A method as claimed in claim 12 wherein said
20 algorithm is performed interactively by a user selecting a line point for commencement of a tracing algorithm which continues until no more acceptable line points are found.

18.   A method as claimed in any preceding claim wherein said error identification and correction comprises an interactive process in which possible errors are presented to a user for verification or correction.

5   19.   A method as claimed in claim 18 wherein in the event of an error being detected a user may select from a number of error correction operations.

20.   A method as claimed in claim 19 wherein said error correction operations include smoothing whereby the curve of 10 a line may be smoothed by fitting said line to a spline.

21.   A method as claimed in claim 19 or 20 wherein said error correction operations include filtering to remove unwanted points.

22.   A method as claimed in any of claims 19 to 21 15 wherein said error correction operations include the joining of line segments.

23.   A method as claimed in claim 22 wherein two line segments may be joined by means of a curve fitted to a plurality of points in each line segment.

20 24.   A method as claimed in any of claims 18 to 23 including character recognition for recognising and deleting characters erroneously identified as line objects.

25.   Apparatus for vectorization of line objects in a colour or grayscale image comprising, means for semi-automatically collecting sample data of line points on line objects within said image, means for extraction of multi-

5 dimensional feature measures from said sample line points, classifying means for grouping said data into clusters each said cluster having a plurality of line points having feature measures within a selected criteria set, means for comparing image points with said clusters to find image points that

10 match with said clusters and for rejecting image points that do not match with any cluster, means for performing a line tracing operation based on detected line points and features, and means for identifying and correcting errors.

26.   A method for the vectorization of line objects in

15 a colour or grayscale image in which sample line points are used to generate a plurality of prototypes, each said prototype comprising a cluster of line points having parameters within defined ranges, and in which line points are detected from the image by matching image points with

20 said prototypes and assigning an image point to a line point where there is a match and rejecting an image point where there is no match.